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Publication date:
2001

No. 2001-66

THE COMPONENTS OF INCOME INEQUALITY IN BELGIUM: APPLYING THE SHORROCKS-DECOMPOSITION WITH BOOTSTRAPPING

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September 2001

ISSN 0924-7815

Discussion paper

The components of income inequality in Belgium: applying the Shorrocks-decomposition with bootstrapping*

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JEL-classification: D31, C23, C63

Keywords: Income inequality, Shorrocks-decomposition, bootstrap.

Summary

We look at the contribution of various income components on income inequality and the changes in this in Belgium. Starting from the Shorrocks decomposition, we apply bootstrapping to construct confidence intervals for both the annual decomposition and the changes over time. It appears that the redistributive impact of the Belgian social security system did not become smaller in an absolute sense between 1985 and 1997, but - due to the large increase in labour income inequality - only in a proportional sense.

* The research has partly been executed when the first author was at the Faculty of Social Sciences, Antwerp University (UFSIA), Belgium.

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1. Introduction

One main objective of social security transfers is to affect the income distribution. This is closely related to the concept of vertical equity, which "*is often identified with the notion that, all other things equal, more egalitarian distributions are preferred to those that are more dispersed*" (Slesnick, 1998, p. 2149). Departing from this concept of vertical equity, it is interesting to consider which income sources cause the observed income inequality. Changes in the distribution of income may result from changes in the distribution of market income, changes in the social security transfers and changes in the proportional number of persons receiving one (or more) of the distinguished income components.

Inequality can be decomposed to subgroups of the population (see for an overview Dagum, 1997 and Kakwani, 1986, and for an application Schwarze, 1996) or to various sources of income. It is this last question which will be dealt with in this article. Rather than concentrating on the overall income inequality and its development over time, we consider what sources of income cause income inequality to increase or decrease, i.e. which income factors contribute to what extent to the inequality of overall income and how does this change over time.

We can disentangle three different 'levels of complexity' when assessing the impact of income sources on the distribution of overall income (OECD, 1997). First of all, we can examine the distribution of the various income sources across deciles. This method is easy to apply, but does not reflect the impact of each income source in one number. Another possibility is to calculate inequality measures for subsequent 'layers of income'. For instance, we first derive income inequality of labour income and then compare it to the income inequality of labour income plus social security income. This method immediately shows the redistributive effect of these income components. For example, if we have a Gini coefficient for labour income of, for example, 0.20 and the Gini coefficient for labour income plus pension income amounts to 0.15, then we can say that the inclusion of pension income with labour income causes income inequality to decrease. Or, put differently, inequality of labour and pension income is lower, relative to – and departing from – the inequality of labour income by itself. This technique is often used, but has some serious drawbacks (Lerman, 1999, p. 341 and further). First of all, interpretation becomes difficult when income sources have

no natural ordening, as the effect of an income source on inequality might depend on whether it has been considered before or after another income source; more specifically, this is the case when income sources are negatively correlated. Secondly, the effect of subtracting an income source on income inequality also depends on the size of the income source. So, a change of the (in)equalizing effect of an income source depends on the change of the size of the income source itself. This latter change is not taken into account.

From the mid-seventies on, technically more advanced methods to decompose income inequality emerged. Lerman (1999) discusses several, among which the one developed by Shorrocks (1982). Shorrocks presented a decomposition which was more general, and technically superior in the sense that it considered the various income sources 'at once' and which was useable for a (limited) number of inequality measures. This decomposition method will be used here to shed light on the redistributive impact of the various income components. However, the Shorrocks decomposition lacks information with respect to the statistical significance.

Here, we apply the Shorrocks-method and also apply bootstrapping in order to derive confidence intervals for the contribution of the various income components towards income inequality. This has been executed for four waves of the Belgian Socio-Economic Panel: 1985, 1988, 1992 and 1997. This panel nature also allows us to derive confidence intervals for the changes in the impact of these income components between successive waves. Here again we apply the bootstrap method. Zandvakili and Mills (2001) apply partly the same method, but they only distinguish between various definitions of income and derive in this way among others the impact of the social security system as a whole So, they do not apply the Shorrocks decomposition and in this respect their application therefore is limited as compared to ours one. The results show that the increase in income inequality between 1985 and 1997 results from an increase in labour income inequality and a more unequal distribution of family allowances. The unemployment benefits and the sickness and disability benefits have mitigated the tendency towards larger income inequality. The effect of the unemployment benefits and the family allowances has also been due to changes in their proportional contribution into total (gross) income.

The plan of the paper reads as follows. The method has been described in section 2. In this section, we also deal with the way in which statistical inference can be dealt with. Section 3 describes the data used and also the Belgian social security system. The results can be found in sections 4 and 5. Section 4 focuses on the contribution of the various income components towards income inequality. Section 5 deals with changes over time. At last, section 6 concludes.

2. Shorrocks decomposition, including statistical inference

The Shorrocks decomposition shows the effect of each income component on overall inequality. The difference with the second method described in the Introduction now becomes clear: there the inequality was derived given the distribution of another income component and interpreted relative to that income component. In the case of the Shorrocks decomposition, the contribution of an income component is the average of two effects, namely

i) the income inequality which would be observed if this income component "*was the only source of income differences*" (Shorrocks, 1982, p. 209), i.e. "*assuming all other income components were equally distributed*" (OECD, 1997, p. 14) and

ii) the effect of the income component on the inequality of the other income components, or the correlation between the income component and total income (Shorrocks, 1983, p. 319).

Without going into the formal details, let Y^k_i denote the income of individual *i* in income category k and let $Y=\Sigma_k Y^k$ be the distribution of total incomes with μ and μ_k as the sample-wide mean income, respectively the mean income in category k. Suppose furthermore that inequality is measured by a function *I(Y)*. The decomposition rule of Shorrocks now consists of two separate steps (Shorrocks, 1982 and 1983). In the first step, Shorrocks shows that there are an infinite number of potential decomposition rules, which are all applicable to all kinds of inequality indices. In the second step, Shorrocks shows that it takes two additional assumptions to reduce the number of decomposition rules to one. The first of these assumptions is known as the Absolut Invariant Axiom, which states that "*a given income source makes no contribution to overall inequality if income receipts from this source are*

equally distributed. The second assumes that if total income is divided in two components whose factor distributions are permutations of each other, then the two components contribute equally to aggregate inequality." (Shorrocks, 1983, p. 316). This assumption is also known as the Two-Factor Symmetry assumption (Shorrocks, 1982). Shorrocks (1983) shows that the contribution of factor k to overall inequality $s_k(I)$ is equal to $cov(Y^k,Y)/\sigma^2(Y)$. The denominator of this ratio, $cov(Y^k,Y)$, can be written as $½[C^A_k + C^B_k]$, where $C^A=I(Y^k+(\mu-\mu_k)e)$ and $C^B=I(Y)-I(Y-Y^k+\mu_k e)$. C^A and C^B reflect the two effects mentioned before. We know that $\Sigma_k\ s_k(I)=I(Y)$, so, the sum of the contributions of the factors to overall income inequality is equal to the overall income inequality. This means that $(s_k(I)\times100)/I(Y)$ is the *proportional* contribution of factor k. In this article, we follow the study of the OECD in applying the Shorrocks decomposition based on the Square Coefficient of Variation, indicated by SCV (OECD, 1997, p15).

Appealing as the Shorrocks decomposition is, it does not answer the question whether or not the observed (in)equalising impacts of various sources of income are statistically significant. The Shorrocks decomposition is not the only technique with this problem, as for most statistical estimators other than the mean, no formula is available for the estimated standard errors (Efron and Tibshirani, 1993, p. 12). Moreover, unlike the Gini coefficient and the Theil coefficient (Mills and Zandvakili, 1997), there is no asymptotic measure of statistical inference for the Shorrocks-decomposition. We therefore apply bootstrapping in order to provide us with the statistical inference of the Shorrocks decomposition. Bootstrapping is a computer-based method of statistical inference, based on the drawing of many independent random observations with replacement from the dataset. From these random samples, the bootstrap-standard error as well as confidence intervals of the Shorrocks-decomposition are estimated by their empirical counterparts, based on the bootstrap-replications (see Efron and Tibshirani, 1993, Stine, 1990 for a brief overview and Mills and Zandvakili, 1997 and Heinrich, 1998, for an application on income inequality).

3. Data and social security in Belgium

In 1976, the Centre for Social Policy interviewed for the first time a representative sample of the Flemish part of the Belgian population. From 1985 on, this was extended to Belgium, and took the form of a paneldata set, with waves in 1985 (6471 households), 1988 (3779 households), 1992 (3821 households) and 1997 (4632 households). Detailed information on all forms of monthly income, education and so forth is gathered at both the household and the individual level[1]. The data is weighted to correct for selectivity bias and in order to correct for differences in household size, equivalent incomes are used (using the EU-scale 1, .5 and .3). The income sources for a household taken into account in this study are total labour income, unemployment benefit, sickness and disability benefits, pension benefits, child allowances and, lastly, 'other sources of income'.

The *unemployment benefit*, which an individual can become eligible to when losing his job is a certain percentage of the last-earned wage, with an upper and a lower benefit limit. Moreover, the benefit is expressed in days of unemployment. If an individual is unemployed for less than the full month or has been working part-time (at least 1/3 of a full job) before becoming unemployed, the monthly unemployment benefit ends up below the lower limit.[2]

The *sickness benefit* also is a certain percentage of the bounded wage, where the bounds differ from those for the other benefits. Both the percentages and the bounds depend on the duration of the sickness and whether or not one is financially responsible for anyone. If one receives a sickness benefit for more than one year, one becomes eligible to a *disability benefit*. As in the case of the sickness benefit, the benefit depends on the bounded wage (with different bounds, however) and on one's marital status (single or cohabiting) or financial responsibility.

For former employees in the private sector and former civil servants, the *pension benefit* is a fraction of the average, respectively the final wage (the average wage of the last 5 years). This fraction depends on the duration of the career of the individual and can at most be 60% (a single pension) or 75% (a household pension, which means

[1] See Cantillon et al. (1999) for a description of the data, as well as the methodological description and Proost et. al. (1996) for a validation.

that the partner loses his or hers own individual pension benefit), after a career of 40 or 45 years (for women and men, respectively). As in the case for the other benefits, these pension benefits have been subjected to a minimum and a maximum, though these boundaries are less strict as in the case of the other benefits.

Compared to other countries, the Belgian system of *child support* is very universal, meaning that its benefits are independent of income. Moreover, the benefit differs strongly with the number of children. So, the vertical redistributive effect is weak, whereas the horizontal redistributive effect is strong (Cantillon et.al., 1995). More redistributive elements have been added in recent times (Cantillon, et al.,1999, p. 154).

The last income category is called '*other income*' and has a residual character. It contains welfare benefits (OCMW), additional unemployment benefits[3], additional pension benefits from pension funds or insurance companies, college grants, alimonies and rentals. Returns on stocks and bonds are not included in this study, since they were not considered in the first waves of the panel and because of the suspicion of underrepresentation of this income component (Cantillon, et al., 1999, p. 33). Some of these income components affect the lower side of the income distribution (OCMW, alimonies), whereas others are more important to high-earning households (additional pension benefits, rentals).

4. Results

The results for the Shorrocks-decomposition for Belgium for the period 1985-1997 can be found in table 1. The first data-column of table 1 shows the decomposition of the SCV attributed to the specific income component. Note that these figures are averages of 200 bootstrap runs. The second column shows the bootstrap-standard deviation. The third and fourth columns show the mean and standard deviation of the proportional contribution of each income component to overall inequality.

[INSERT TABLE 1]

[2] For a comparison with other systems, see De Lathouwer (1997).
[3] Benefits from the "Fondsen voor Bestaanszekerheid" , employer-funded on the sector-level providing additional benefits in the case of among others technical unemployment.

The overall SCV amounts to 79.5 in 1985, 89.8 in 1988, 93.0 in 1992 and 121.2 in 1997. We will come back to this later; the first and second columns of table 1 are merely given for completeness' sake. The third column describes the proportional contribution of the income sources to the overall inequality, and these are of more interest to us. It immediately shows the enormous importance of labour income. About 75% of overall inequality can be attributed to labour income in 1985. This percentage even increases via 79% to 90% in 1992 and then returns to 83% in 1997.

Given these high proportions, it is not surprising that the proportional contribution of the other income components is by far less important. In fact, apart from 'other income components' (which, due to its residual character, is less interesting), the only significant (negative) contribution to inequality in all years comes from the unemployment benefit. The negative sign means that these receipts are negatively correlated with respect to inequality with total income. Household unemployment benefits cause overall inequality to decrease by 2.5% in 1985. For the other years, this equalising force increases somewhat, as opposed to what we saw with labour income. In 1997, unemployment benefits reduce inequality by 2.8%. According to the third column of table 1, pension benefits have a 2.5% and a 1.2% equalising effect in 1985 and 1988, respectively, whereas it increases inequality by 0.5% and 0.6% in 1992 and 1997, respectively. However, the bootstrap-confidence intervals show that the hypothesis that the effect of pension income on total income inequality is zero can not be rejected. The same holds for the effect of the child support benefit on income inequality up to and including 1992. However, for 1997 we find a significant income inequality enlarging effect of 0.5%. The effect of the sickness and disability pension benefit is also ambiguous. In 1985 and 1992, the hypothesis that its effect on overall inequality is zero can not be rejected. In 1988 and 1997, this benefit has a very small but distinct equalising effect.

On the whole, the conclusion is that income inequality is to the largest extent caused by the inequality of labour income (and this effect becomes stronger over time), whereas the unemployment benefit is the only significant equalising income factor for all years under consideration. However, the discussion of table 1 answers fewer questions than it produces: what causes the insignificant results for, say, the pension

benefit and the child support benefit? Given the description in section 3, one would expect that these benefits would decrease income inequality quite strongly. There is more than one answer to this question. First of all, the above table shows the Shorrocks decomposition for the sample as a whole. It is possible that a certain income component has a strong effect on the income inequality of a certain group, but that this strong effect is 'polluted' by the other groups of individuals in the sample. For instance, we can expect that the effect of the child support benefit on income inequality will be strong for households where the head is younger than 65, whereas the effect of the pension income will be strong for households where the head is 65 or older. The second explanation shows why the results of a Shorrocks decomposition require a careful analysis. It was said earlier that these results are the combination of two effects C^A and C^B. The first is the inequality of income if the income component under consideration was the only one not to be distributed equally. This effect excludes all interaction effects. The second reflects the correlation between that income component and total household income. In this case, all interaction effects are taken into account (Lerman, 1999). C^A is by definition positive, but C^B may be negative, indicating that this factor tends to compensate for differences in incomes received from other sources (Shorrocks, 1982, p. 209). So, the effect of a negative C^B on the Shorrocks-decomposition always is partially compensated by C^A, whereas this compensation does not occur when C^B is positive.

The first explanation has been looked at by breaking down the analysis for non-aged and aged heads of households. It appears that the main determinant of overall income inequality for the households, of which the head is younger than the retirement age, is the inequality of labour income. In 1985, almost 82% of total inequality was caused by this income component.[4] For the other years, this percentage increased to 97% and 98% and then decreased again to 93%. The social security incomes all compensate for this high effect of labour income, though the hypothesis of these effects being equal to zero can not always be rejected. The unemployment benefit has a quite strong and significant equalising effect for all years: in 1985, income inequality decreased with 4.3% as a result of the unemployment benefit. This percentage is somewhat higher for the other years. The equalising effect of the sickness and disability benefit appears to

[4] The tables are available from the authors upon request.

be considerably smaller, though significant as well. It varies between 1.9% in 1988 and 0.9% in 1985. The fact that the equalising effect of the pension benefit does not significantly differ from zero in all four years under consideration, is not surprising given the fact that pension income is by itself a function of the past wage (even though this relation is not direct), and that it forms about 8% of total household income of this category of 'young' households. So, it is a combination of pension income not being very equalising by itself, nor a very important source of income. A priori, we would expect that the child support benefit would to some extent compensate for the inequality increasing effect of labour income. This is confirmed by the data: the child support benefit has a very weak but significant equalising effect. It decreases income inequality for the young households with 1% or a bit less in 1985, 1988 and 1992. It is only in the last year under consideration that its equalising effect becomes insignificant.

Income inequality appears to be higher for households where the head is older than the mandatory retirement age (this is in line with the findings by Meulemans and Cantillon, 1993 and Dekkers, 1998). The proportional contribution of labour income, which was on average 92% for young households, is on average 15% now. Its effect remains significant, however, with the exception in 1988. The main reason for the difference is of course that the head of the household is no longer working, so the labour income of the household should come from the partner, or from children in the household. The role of labour income as the main determinant of inequality has been taken over by pension income. In 1985, pension income caused about 30.9% of total income inequality. This percentage then increased via 37.7% in 1988 to no less than 66.1% in 1992, after which it decreased to 45.6% in 1997. This effect significantly differs from zero in all years and is partially caused by a higher proportional value of pension income for old households.

It further appears that the inequality-increasing effect of ‘other’ income increases strongly in comparison with young households and even almost causes 50% of the inequality of total income in 1985. Elderly proportionally receive higher rents than the young households do. Moreover, and this is a second explanation, this income category also includes college grants by the government. This is a highly targeted and therefore equalising system, with grants paid to households with children who at least

attain senior vocational training and where both the income as well as the tax-base value of the house is below a certain level. This system is more beneficiary to young than to old households. Both these elements explain why 'other income' is more strongly adding to total inequality in the case of the old households, as compared to the young households[5].

The effect of the unemployment benefit and child support benefit is now insignificant. Another equalising source of income in the case of the young households, the sickness and disability pension benefit, now becomes insignificant (1988 and 1997) or even inequality-increasing. However, in this case, the reason for this must be a change of the 'pure' inequality of these benefits, since a change of the proportion can never cause a change of the sign of the Shorrocks-decomposition.

5. Changes over time

We now look at the impact of the various income components on overall income inequality over time. The foregoing has been based on 200 bootstrap samples, which have been randomly drawn from the datasets, separately for each of the four years under consideration. The resulting bootstrap means and standard errors for the change over time can then be derived from the standard errors reported in section 4 and their correlation. Assume $s^b_{k,1}(I)$ and $s^b_{k,2}(I)$ to be the bootstrap mean contribution of income factor k to overall income inequality in time point 1 and 2, respectively. Then, the standard error for the difference amounts to $SE(s^b_{k,1}(I)) + SE(s^b_{k,2}(I)) - 2*COV[s^b_{k,1}(I), s^b_{k,2}(I)]$; see Kalton (1984).

We start by considering the overall change of the SCV (called D) between the four years under consideration. These results have been shown in table 2.

[INSERT TABLE 2]

[5] It is interesting to see that the proportional size of this income component for the four years under consideration is a factor 2.13, 1.51, 1.44 and 1.63 higher. The proportional value of the Shorrocks-decomposition however is a factor 2.7, 8.36, 1.78 and 3.06 higher! So, the increase of the proportional effect of 'other income' on the inequality of total income is only partially caused by the increase of the proportional importance of the income factor itself. Consequently, the 'pure' inequality of this income category must be higher in the case of old households than in the case of young households. This again is in line with our expectation that 'other income' consists more of rents (which are highly unequal) in the case of old households, and college grants (which are highly equalising) in the case of young households.

Between 1985 and 1988 the overall change of the SCV amounts to 10.37 with a bootstrap-standard-error of 15.03. Consequently, the hypothesis that this change does not significantly differ from zero cannot be rejected. This also holds for the change between 1988 and 1992. Between 1992 and 1997, however, the SCV increased significantly. For the whole period 1985-1997 D is also significant positive. It amounts to 42.74 (and a standard deviation of 11.32)

Labour income positively contributes to the changes in the SCV in the course of time. This contribution is significant at the 10%-level for the period 1985-1988 and 1992-1997. In the first period, the increase in the SCV is significantly lowered by the unemployment benefit and the sickness and disability benefit. We further observe a significant impact with respect to 'other income' between 1992 and 1997. As stated, total inequality increases by 42.74 points between 1985 and 1997. This is largely due to the increase in labour income inequality (40.01 points). Also child allowances significantly contribute to the increase in income inequality. On the other hand, unemployment benefits and sickness and disability benefits have significantly lowered the increase in total income inequality.

[INSERT TABLE 3]

The changes are only very partly caused by changes in the composition of total income. Table 3 reports on this. The only significant contribution through this mechanism during the three periods under consideration concerns the sickness and disability benefit during the period 1985-1988 and 'other income' during the period 1992-1997. The first one results in a lowering of the growth in the SCV, whereas the latter strengthens the increasing tendency. Between 1985 and 1997 the contribution of unemployment benefits lowered, whereas the proportion of family allowances increased significantly. So, changes in the composition of total (gross) income had an only limited impact on the evolution of income inequality in Belgium between 1985 and 1997.

6. Conclusions

One of the goals of the social security system is to redistribute income. However, evaluation of the resulting redistributive impact and the changes in it, seldom occurs. In the past this might be explained by methodological problems. But actually these problems have largely been solved by Shorrocks in the 1980s. However, a disadvantage of the Shorrocks-decomposition is that it lacks information with respect to the statistical inference. Deriving e.g. confidence intervals on the basis of bootstrapping can solve this. Here, we use Belgian data to demonstrate the possibilities of this combined approach. Studying labour income and the social security benefits, overall income inequality as represented by the square coefficient of variation has been decomposed into the various components. We also look at the changes in the course of the period 1985-1997. It appears that the increase in the SCV by 42.784 points during this period can be attributed largely towards the labour income component. Child allowances also significantly contributed towards the increase, but unemployment and sickness and disability benefits limited the increase in income inequality. As a consequence the contribution of the social benefits towards the SCV remained stable during the period under investigation. But as labour income inequality increased, the proportional contribution of the social security benefits towards the SCV lowered. An important conclusion from this is that the redistributive impact of the Belgian social security system did not become smaller in an absolute sense, but - due to the large increase in labour income inequality - only in a proportional sense.

References

Cantillon, B., Storms, B., Verbist, Van den Bosch, K., 1995, *Wegen naar een grotere doelmatigheid van kinderbijslag en belastingaftrek voor kinderen ten laste*. CSB-berichten, Centre for Social Policy, Antwerp University.

Cantillon, B., De Lathouwer, L., Marx, I., Van Dam, R., Van den Bosch, K., 1999, *Sociale Indicatoren 1976-1997*. CSB-berichten, Centre for Social Policy, Antwerp University.

Cantillon, B. (ed), 1999, *De Welvaartsstaat in de Kering*, Uitgeverij Pelckmans, Kapellen.

Dagum, C., 1997, A new approach to the decomposition of the Gini inequality ratio, *Empirical Economics*, 22, pp. 515-531.

Dekkers, G., 1998, *The Future Development of Standards of Living of the Elderly: an Application of the Static Microsimulation Model STATION*. Presentation at the SSCT / DWTC-meeting organized by the CREPP, Université de Liège, Liège, Belgium, October 9th, 1998.

De Lathouwer, L., 1997, Het Belgische werkloosheidsstelsel in internationaal perspectief, *Economisch en Sociaal Tijdschrift*, vol. 51, no 2, pp 195-238.

Efron, B., Tibshirani, 1993, *An Introduction of the Bootstrap*, Chapman&Hall, New York – London.

Heinrich, G., *Changing Times, Testing Times: A Bootrstrap Analysis of Poverty and Inequality Using the PACO Data Base*. Centre for Economic Reform and Transformation CERT working paper, Heriott-Watt University, Edinburgh.

Kalton, G., 1984, *Introduction to survey sampling*. 2nd edition, Sage Publications, Beverly Hills/London/New Delhi.

Kakwani, N, 1986, *Analyzing Redistribution Policies: a study using Australian Data*. Cambridge University Press, Cambridge.

Lerman, R., 1999, How do income sources affect income inequality? In Silber, J. (ed), *Handbook of Income Inequality Measurement*, Kluwer Academic Publishers, Boston / Dordrecht / London, pp. 341-362.

Meulemans, B., Cantillon, B., 1993, De geruisloze kering: de nivellering van de intergenerationele welvaartsverschillen, *Economisch en Sociaal Tijdschrift*, 47, pp. 421-448.

Mills, J., Zandvakili, S., 1997, Statistical inference via bootstrapping for measures of inequality, *Journal of Applied Econometrics*, 12, pp 133-150.

OECD, 1997, *Income Distribution and Poverty in Selected Countries*, Working paper no 1 on Macroeconomic and Structural Policy Analysis, ECO/CPE/WP1(97)8.

Proost, D., van Dam, R., Van den Bosch, K., 1996, *Valideringsstudie van twee Belgische Inkomenssurveys*. CSB-berichten, Centre for Social Policy, Antwerp University.

Schwarze, J., 1996, How income inequality changed in Germany following reunification: an empirical analysis using decomposable inequality measures, *Review of Income and Wealth*, vol. 42, pp. 1-11.

Shorrocks, A., 1982, Inequality decomposition by factor components, *Econometrica*, 50, pp. 193-211.

Shorrocks, A., 1983, The impact of income components on the distribution of family incomes, *Quarterly Journal of Economics*, 98, pp. 311-326.

Slesnick, D., 1998, Empirical approaches to the measurement of welfare, *Journal of Economic Literature*, 36, pp. 2108-2165.

Stine, R., 1990, An introduction to bootstrap methods, *Sociological Methods and Research*, 18, pp. 243-291.

Zandvakili, S., Mills, J., 1997, Statistical inference via bootstrapping for measures of inequality, *Journal of Applied Econometrics*, 12, pp. 133-150.

Zandvakili, S., Mills, J., 2001, The distributional implications of tax and transfer programs in US, *Quarterly Review of Economics and Finance*, 41, pp. 167-181.

Table 1: The Shorrocks-decomposition for the sample as a whole.

	Shorrocks-decomposition		Proportion	
1985	Average	STD	Average	STD
Labour	59.652	2.240	0.753	0.045
Unempl.	-2.002	0.159	-0.025	0.002
Sickn.&dis.	0.187	0.271	0.002	0.003
Pension	-1.943	1.853	-0.025	0.024
Child	-0.010	0.126	-0.000	0.001
Other	23.574	4.212	0.295	0.037
Total	79.456	5.128		
1988				
Labour	72.120	6.411	0.792	0.111
Unempl.	-2.421	0.234	-0.026	0.004
Sickn.&dis.	-0.719	0.238	-0.007	0.002
Pension	-0.905	3.063	-0.012	0.032
Child	0.256	0.177	0.003	0.002
Other	21.491	12.505	0.251	0.097
Total	89.823	14.395		
1992				
Labour	83.587	3.535	0.902	0.065
Unempl.	-2.624	0.337	-0.028	0.004
Sickn.&dis.	-0.438	0.377	-0.005	0.004
Pension	0.863	6.895	0.005	0.071
Child	0.305	0.169	0.003	0.002
Other	11.344	2.009	0.122	0.021
Total	93.037	6.440		
1997				
Labour	99.659	5.407	0.826	0.065
Unempl.	-3.450	0.425	-0.028	0.004
Sickn.&dis.	-1.029	0.404	-0.009	0.003
Pension	0.925	5.969	0.006	0.048
Child	0.568	0.203	0.005	0.002
Other	24.527	6.777	0.201	0.045
Total	121.201	9.370		

Table 2. Change of SCV between successive years and its bootstrap standard deviation

	1988-1985		**1992-1988**		**1997-1992**		**1997-1985**	
	SCV	s.d.	SCV	s.d.	SCV	s.d.	SCV	s.d.
Labour	12.47	6.840	11.47	7.991	16.07	6.548	40.01	6.150
Unempl.	-0.418	0.267	-0.203	0.406	-0.825	0.527	-1.448	0.418
Sickn.&dis.	-0.905	0.359	0.281	0.441	-0.590	0.578	-1.216	0.504
Pension	1.038	3.389	1.768	8.007	0.062	9.090	2.868	6.326
Child	0.267	0.212	0.049	0.252	0.263	0.260	0.578	0.234
Other	-2.083	12.76	-10.15	12.76	13.18	7.129	0.952	8.804
Total	10.37	15.03	3.214	15.29	28.16	11.49	42.74	11.32

Table 3. Change of the proportion between successive years and its bootstrap standard deviation

	1988-1985		**1992-1988**		**1997-1992**		**1997-1985**	
	proportion	s.d.	proportion	s.d.	proportion	s.d.	proportion	s.d.
Labour	3.9	11.5	11.0	13.1	-7.6	9.4	7.2	8.5
Unempl.	-0.1	0.5	-0.2	0.6	0.0	0.6	-3.1	0.5
Sickn.&dis.	-0.9	0.4	0.2	0.5	-0.4	0.5	-2.4	10.6
Pension	1.3	4.1	1.7	8.1	0.1	8.7	2.8	5.5
Child	0.3	0.3	-0.0	0.3	0.2	0.3	0.5	0.2
Other	-4.4	10.0	-12.9	9.9	7.9	5.0	-9.1	6.6